

Having described the invention, the following is claimed:

1. A vehicle occupant sensor apparatus comprising:
 - means for modulating a scanned occupant beam;
 - means for mapping occupant contours in response to the modulated beam; and
 - means for determining an occupant characteristic in response to the mapped contours.
2. An apparatus as set forth in claim 1, wherein said means for mapping comprises means for receiving beam reflection and means for determining phase difference of the beam.
3. An apparatus as set forth in claim 1, wherein said means for mapping comprises means for directing the beam across a scan area.
4. An apparatus as set forth in claim 3, wherein said means for directing comprises a movable reflecting member.

5. An apparatus as set forth in claim 3, wherein said means for directing comprises a MEM device that has a reflective surface portion.

6. An apparatus as set forth in claim 5, wherein said reflective surface portion is movable in response to electrostatic force and said MEM device comprises means for providing electrostatic force to move said reflective surface.

7. An apparatus as set forth in claim 1, wherein means for modulating comprises an electromagnetic energy emission source and a drive component that drives said source at a modulation.

8. An apparatus as set forth in claim 7, wherein said electromagnetic energy emission source comprises an infrared LED.

9. An apparatus as set forth in claim 1, wherein said means for determining an occupant characteristic comprises means for determining occupant presence.

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10. An apparatus as set forth in claim 1, wherein said means for determining an occupant characteristic comprises means for determining occupant location.

11. An apparatus as set forth in claim 1, wherein said means for determining an occupant characteristic comprises means for determining occupant type.

12. An apparatus as set forth in claim 1, further comprising means for providing an indication of the determined occupant characteristic to means for determining control of an occupant protection device.

13. An apparatus as set forth in claim 12, wherein the occupant protection device is an air bag module.

14. A vehicle occupant sensor apparatus comprising:

beam means for emitting a beam;

modulation means for modulating the beam;

scan means for directing the beam toward the occupant in a pattern that moves across a plurality of points on the occupant;

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receiver means for receiving reflection of the beam from the occupant;

phase determination means for determining phase difference between the emitted beam and the reflection associated with each point on the occupant;

map means for mapping a contour and location representation of the occupant using the determined phase differences; and

characteristic determination means for determining at least one occupant characteristic of the occupant using the contour and location representation of the occupant.

15. An apparatus as set forth in claim 14, wherein said beam means comprises an infrared LED.

16. An apparatus as set forth in claim 14, wherein said scan means comprises a MEM device.

17. An apparatus as set forth in claim 14, wherein said MEM device comprises a reflective surface component that is movable about two axes.

18. An apparatus as set forth in claim 17, wherein the movement of said reflective surface component about a first of the two axes is an oscillation on the order of 3,000 Hz and the movement of said reflective surface component about a second of the two axes is an oscillation on the order of 30 Hz.

19. An apparatus as set forth in claim 14, wherein said modulation means comprising means for modulating the beam at a frequency on the order of 3 MHz.

20. An apparatus as set forth in claim 14, wherein said characteristic determination means comprises distance determination means for determining distance to each point on the occupant using determined phase difference.

21. An apparatus as set forth in claim 14, further comprising means for providing an indication of the determined occupant characteristic to means for determining control of an occupant protection device.

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22. A method of vehicle occupant sensing
comprising:

modulating a scanned occupant beam;
mapping occupant contours in response to the
modulated beam; and
determining an occupant characteristic in
response to the mapped contours.

23. A method of vehicle occupant sensing
comprising:

emitting a beam;
modulating the beam;
directing the beam toward the occupant in a
pattern that moves across a plurality of points on the
occupant;
receiving reflection of the beam from the
occupant;
determining phase difference between the
emitted beam and the reflection associated with each
point on the occupant;
mapping a contour and location representation
of the occupant using the determined phase differences;
and

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determining at least one occupant
characteristic of the occupant using the contour and
location representation of the occupant.

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